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SUMMARY

The relative susceptibility of four titanium-alloy sheet materials to salt stress corrosion at 550° F has been determined from room-temperature compression tests of a new type of self-stressed specimen and from crack penetration measurements. Based on the accelerated test conditions, Ti-8Al-1Mo-1V was found to be most susceptible followed by Ti-6Al-4V, Ti-13V-11Cr-3Al, and Ti-4Al-3Mo-1V. No stress corrosion was observed in the Ti-4Al-3Mo-1V. Compression tests of the new corrosion specimen appear to be a simple and rapid method of determining the susceptibility of a material to stress corrosion.

INTRODUCTION

An extensive screening program is currently in progress in this country to provide a suitable material for a Supersonic Commercial Air Transport (ref. 1). The titanium alloys along with stainless steels and superalloys are being considered for application as skin material for such an aircraft. One particular area in which the skin materials must be evaluated is that of stress corrosion. In general, the titanium alloys are quite resistant to corrosion at room temperature but several titanium alloys have shown marked susceptibility to stress corrosion at elevated temperatures when in contact with sodium chloride (ref. 2).

In this investigation the relative susceptibility of four commercially available titanium-alloy sheet materials to stress corrosion cracking at 550° F is studied by using a new type of self-stressed specimen coated with sodium chloride. The evaluation includes determination of bend ductility and a metallurgical examination of stress corrosion cracks. The effect of changes in the specimen stress level and the salt-coating thickness on stress corrosion were also investigated. The experimental procedure, data, and results are given herein.

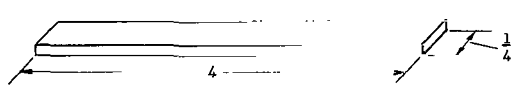
MATERIALS AND SPECIMEN

The titanium alloys, Ti-6Al-4V, Ti-8Al-1Mo-1V, Ti-4Al-3Mo-1V, and Ti-13V-11Cr-3Al, included in this study, are listed in the table with their respective producers, heat treatments, and mechanical properties.

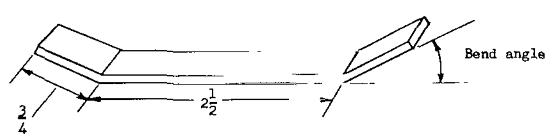
Alloy	Nominal thick-ness, in.	Producer	Heat number	Heat treatment or condition	*Yield strength, ksi		*Tensile strength, ksi		*Elongation, percent in 2 in.	
					Longi-tudinal	Trans-verse	Longi-tudinal	Trans-verse	Longi-tudinal	Trans-verse
Ti-6Al-4V	0.040	Titanium Metals Corporation of America	M-9774	Annealed 1 hour at 1,475° F, F.C. to 1,300° F, A.C.	137.5	140.0	145.2	146.0	12.7	13.2
Ti-8Al-1Mo-1V	.040	Titanium Metals Corporation of America	V-1552	Single anneal, 8 hours at 1,450° F, F.C.	145.5	147.0	156.2	159.0	17.7	16.2
Ti-13V-11Cr-3Al	.040	Titanium Metals Corporation of America	M-9470	Aged for 24 hours at 900° F in argon	168.0	172.0	182.0	190.0	8.5	7.0
Ti-4Al-3Mo-1V	.040	Crucible Steel Company of America	R-6749	Aged 4 hours at 1,050° F in argon	120.0	148.0	136.7	159.0	10.7	7.0

*Unpublished NASA data.

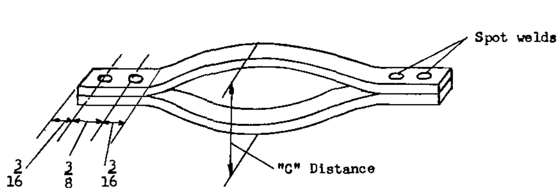
The self-stressed specimen, shown in figure 1, utilized pure bending to produce tensile stress in the outer fibers and compressive stress in the inner fibers of each strip member. The magnitude of these stresses depends on the distance "C" and may be calculated from the geometry of the specimen and the equations associated with pure bending. A "C" distance of 0.5 inch was used to obtain a tensile stress of approximately 100 ksi in the curved portion of the 40-mil strips. Some additional Ti-6Al-4V and Ti-8Al-1Mo-1V specimens were constructed with a "C" distance of 0.3 inch which produced a maximum tensile stress of about 50 ksi.



(a) Machined strip.



(b) Strip with ends bent.



(c) Completed specimen.

Figure 1.- Construction of the self-stressed specimen. (All dimensions are in inches.)

PROCEDURE

Specimen Fabrication

Self-stressed specimens were constructed from each of the four titanium alloys, as follows:

(1) Cut and machine 4- by 1/4-inch strips (See fig. 1(a).)

(2) Heattreat if applicable (See table.)

(3) Bend ends of each strip to proper bend angle (approximately 25° for 100 ksi and 12° for 50 ksi) (See fig. 1(b).)

(4) Clean the strips chemically
  (a) Clean with acetone and cloth
  (b) Immerse in NaOH base cleaner (6 ounces NaOH per gallon of water) at 200° F for 10 minutes
  (c) Rinse in hot water
  (d) Dip in 20-percent nitric acid solution for 30 seconds
  (e) Rinse thoroughly in water and dry

(5) Place two cleaned strips together, clamp the ends and spotweld (See fig. 1(c).) All specimens were handled carefully with clean white gloves throughout this operation to prevent any contamination.

Salt Coating

The corroding agent, pure sodium chloride, was applied by dipping the specimen into a boiling, supersaturated salt solution and drying it in an oven at 250° F. This procedure was repeated for as many times as needed to produce a uniform salt coating over the entire surface of the specimen. This "heavy" coating weighed approximately 0.55 to 0.65 gram and was 0.004 to 0.006 inch thick. Several Ti-6Al-4V specimens were coated with "medium" coatings (weight, 0.2 to 0.3 gm; thickness, 0.002 to 0.003 inch) and "light" coatings (weight, 0.05 to 0.08 gm; thickness, 0.0004 to 0.0007 inch) to study what effect the amount of salt has on stress corrosion cracking. The heavy and medium coatings were uniformly white, but the light coatings consisted of a transparent salt film with scattered crystals.

Elevated-Temperature Exposure

The salt-coated and uncoated specimens were placed in separate electric ovens at 550° F under circulating ambient air conditions. Both the coated and uncoated specimens were removed after various exposure times ranging from 50 to 10,000 hours.

Mechanical Tests

After exposure at 550° F, the salt coatings were removed with a water rinse and the specimens were tested under compression at room temperature. The compression tests were accomplished by using two clamping fixtures to support the specimen vertically in a hydraulic testing machine (fig. 2). Load was applied at 200 pounds per minute and recorded autographically against head displacement. The head displacement or

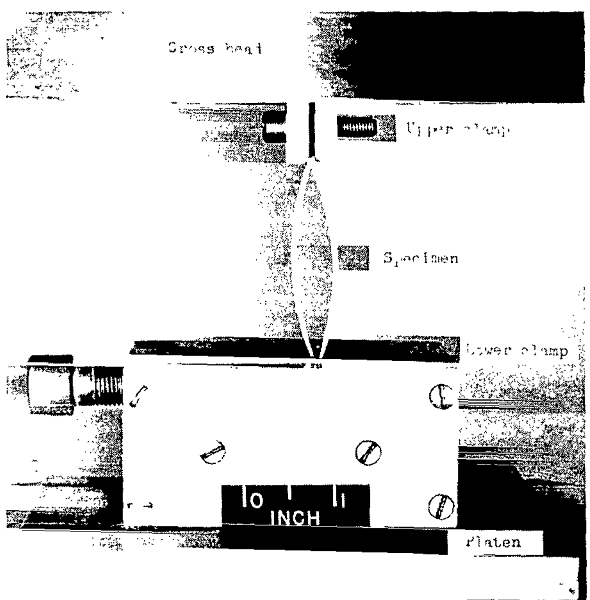


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Figure 2.- Clamping fixtures and compression-test apparatus.

specimen shortening was measured by using a deflectometer consisting of an aluminum-alloy cantilever beam instrumented with strain gages at the base of the beam.

Metallographic Examination

Crack nucleation, crack propagation, and crack penetration were investigated metallographically. The effect of changing the amount of salt coating or coating thickness on crack penetration was also studied. The examination consisted of first cutting sections approximately 1/2 inch long from the curved portion of untested specimens for each exposure time. These sections were then mounted, polished, and chemically etched with a solution made of 97 percent H_2O, 2 percent HNO_3, and 1 percent HF, by volume. Some sections were mounted on edge in order to examine the crack penetration while others were mounted flat to show cracks along the surface. Penetration of the cracks into the base material was measured by using a light microscope with a micrometer eyepiece. Photomicrographs and electron micrographs were made of representative cracks to aid in the study of stress corrosion cracking in the four titanium alloys.

RESULTS AND DISCUSSION

Mechanical Tests

The effect of stress corrosion cracking on the bend ductility of the specimens is shown by the change in specimen shortening at fracture in the room-temperature compression tests. Exposed specimens that were not susceptible to stress corrosion maintained their original bend ductility. In most tests, this meant they could be compressed to a condition of "maximum shortening" obtained when the specimen legs were in contact with the fixture without fracture occurring, as illustrated for the uncoated specimen in figure 3. Coated specimens that were susceptible to stress corrosion cracking suffered losses in bend ductility, and relatively small amounts of shortening produced specimen fracture as shown in figure 4. As load was applied, the curvature increased until yielding occurred. Then the specimen legs began to straighten between the ends and center as shown in figure 4. As the specimen continued to shorten, the bending at the center increased until fracture occurred in one or both legs.

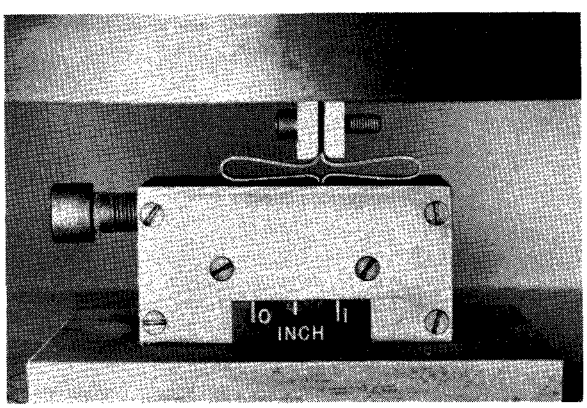

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Figure 3.- Uncoated specimen at condition of "maximum shortening" without fracture.

The configuration of coated and uncoated specimens of Ti-8Al-1Mo-1V, stressed at 100 ksi for 2,000 hours at 550° F, is shown in figure 5. The loss of bend ductility due to stress corrosion

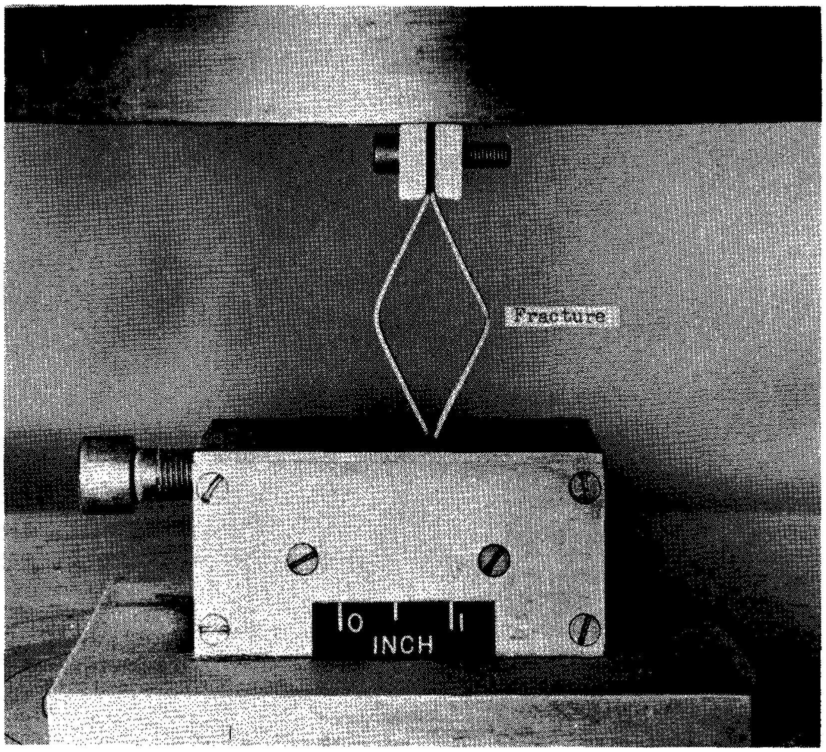

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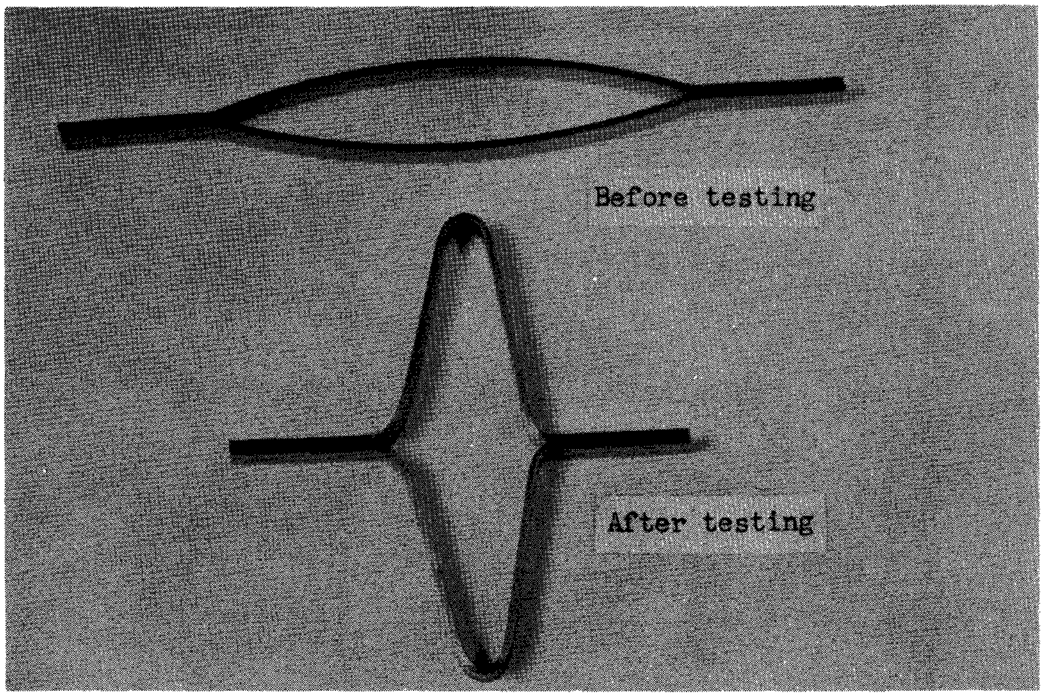
Figure 4.- Fracture of coated specimen after a small amount of shortening.

cracking is clearly demonstrated by the reduced shortening and the fracture of the coated specimen.

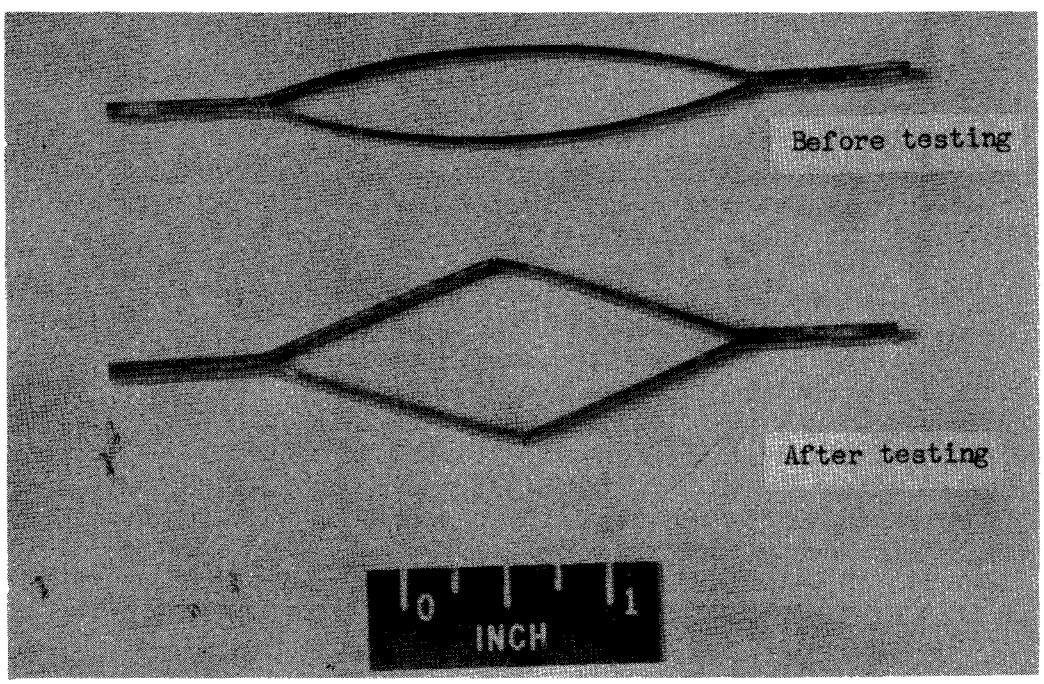
The effect of salt stress corrosion on the shortening or bend ductility is discussed next for each material. These results will be correlated with actual crack penetration measurements in the section entitled "Metallographic Examination."

Ti-6Al-4V.- The results of the compression tests of coated and uncoated Ti-6Al-4V specimens, stressed to 100 ksi and exposed at 550° F up to 10,000 hours, are shown in figure 6. The dashed load-shortening curve (fig. 6(a)) represents all the tests of the uncoated specimens exposed up to 10,000 hours; these specimens all reached a condition of maximum shortening without fracture. The solid curves are representative of the tests for coated specimens in which the most severe corrosion effects were obtained at each exposure. These curves are essentially the same as those for the uncoated specimens up to the point where a sudden decrease in load occurs and fracture takes place. The shortening at fracture decreases appreciably with increasing exposure time, and indicates considerable decrease in bend ductility and greater severity of stress corrosion at the longer times.

The shortening at fracture obtained in the individual tests from the load-shortening curves such as those illustrated in figure 6(a) are shown in figure 6(b) for the coated and uncoated specimens. In accordance with figure 6(a), the uncoated specimens maintained their original bend ductility (dashed curve in figure 6(b)) whereas the solid points and lower limiting curve show that most of

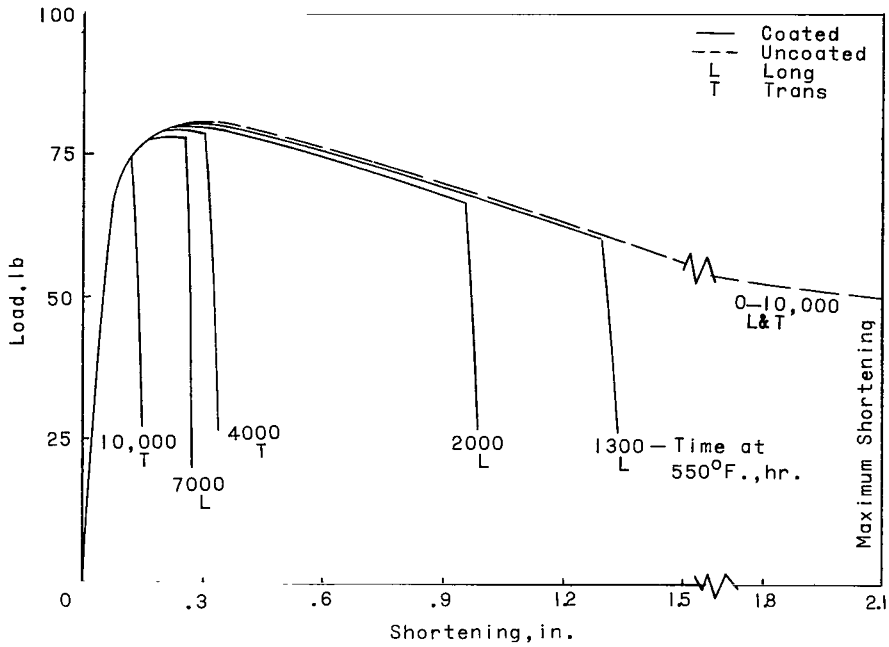


(a) Uncoated.

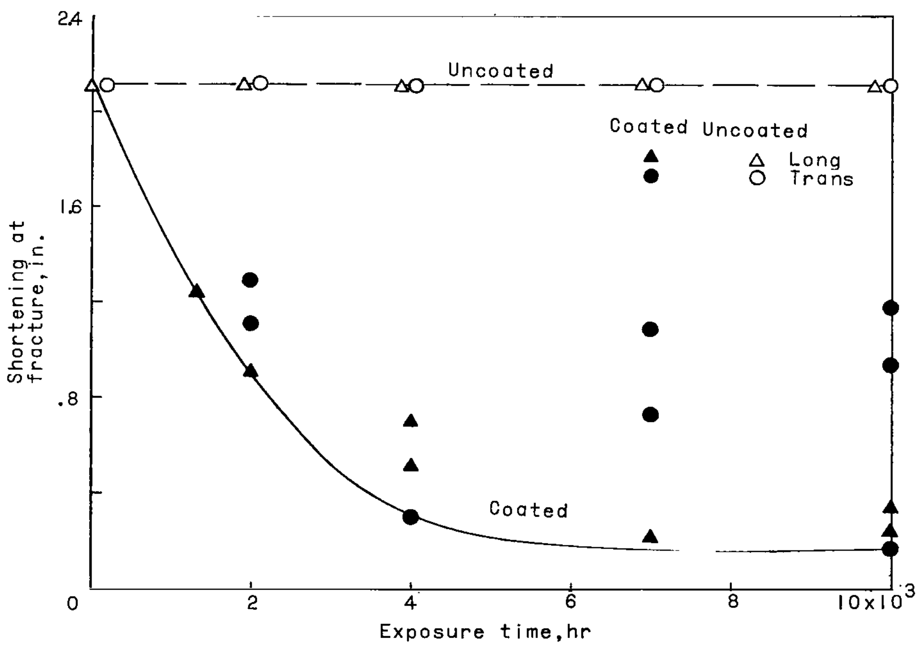


(b) Coated. L-63-4712

Figure 5.- Coated and uncoated Ti-8Al-1Mo-1V specimens stressed at 100 ksi before and after testing. The specimens were exposed at 550° F for 2,000 hours prior to testing.



(a) Load-shortening curves.



(b) Shortening at fracture as a function of exposure time.

Figure 6.- Results of compression tests for Ti-6Al-4V specimens stressed at 100 ksi.

the bend ductility was lost within 4,000 hours of exposure. The solid curve, therefore, represents the most severe effects due to stress corrosion obtained in these tests. Because of the scatter of data, which can be expected in stress corrosion evaluations, and the limited number of tests, uncertainty exists as to the effect of grain direction.

No loss in shortening or bend ductility was observed for Ti-6Al-4V specimens stressed to 50 ksi and exposed up to 3,000 hours.

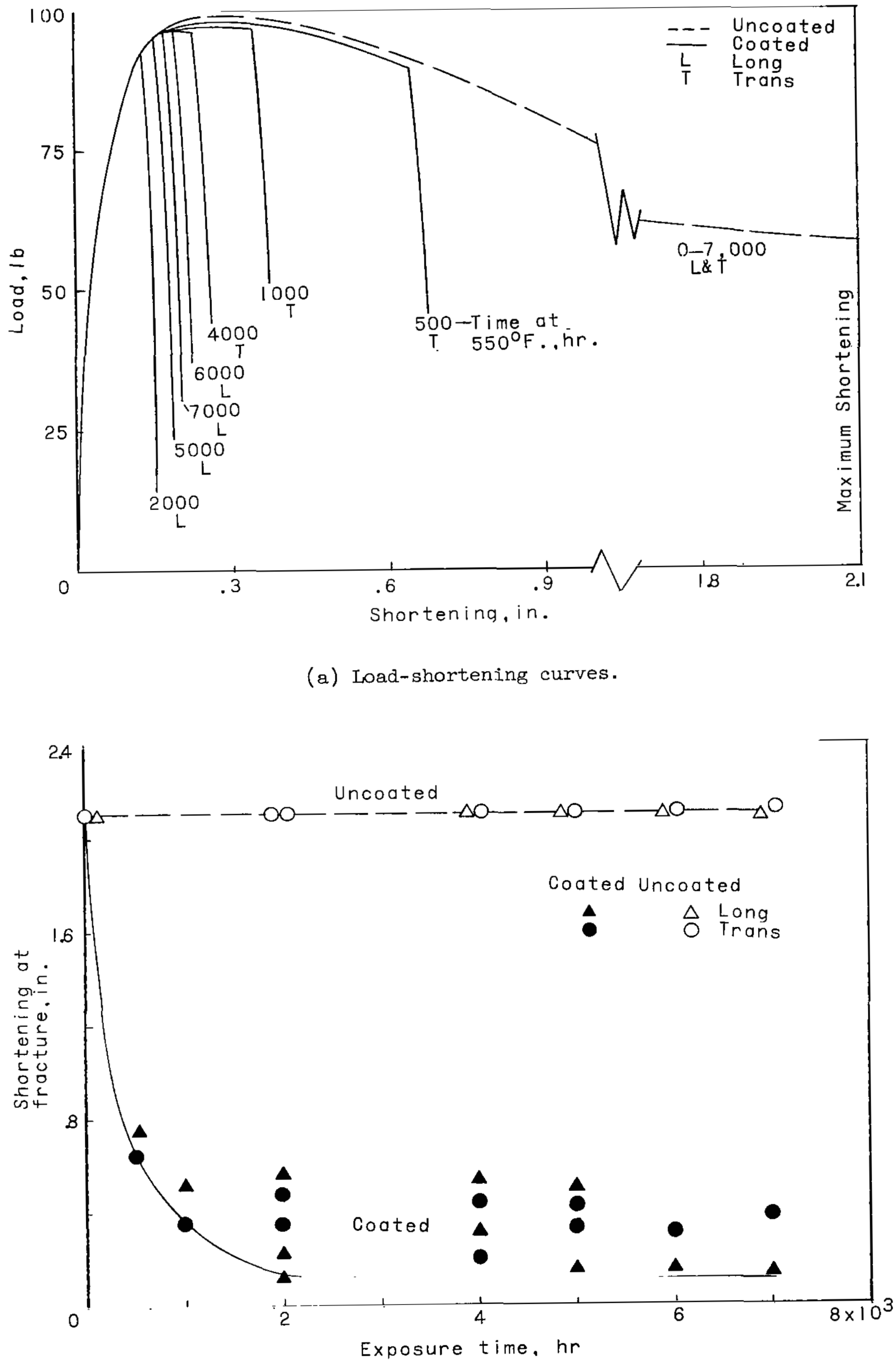
Ti-8Al-1Mo-1V.- The results of the compression tests of the coated and uncoated Ti-8Al-1Mo-1V specimens stressed to 100 ksi are shown in figure 7. The uncoated specimens (fig. 7(a)) exposed up to 7,000 hours reached maximum shortening without fracture. The coated specimens, however, required relatively little shortening to produce failure. The shortening at fracture decreased with exposure time in a consistent manner until 4,000 hours was reached. A possible explanation for the scatter above 4,000 hours will be discussed in the section entitled "Crack Penetration." Figure 7(b) shows that the coated specimens lost most of their bend ductility within 2,000 hours while the uncoated specimens maintained their original bend ductility.

The results for the Ti-8Al-1Mo-1V specimens stressed at 50 ksi are shown in figure 8. Figure 8(a) shows that exposure affected only the coated specimens. Again, the shortening necessary for fracture decreases with exposure time. The values of shortening at fracture (fig. 8(b)) indicate that the bend ductility drops considerably within 1,000 hours exposure.

Ti-13V-11Cr-3Al.- The results for the Ti-13V-11Cr-3Al specimens stressed at 100 ksi are shown in figure 9. Figure 9(a) shows that only the coated specimens failed before reaching maximum shortening and that shortening necessary for fracture decreases with exposure time. The difference in mechanical properties between the longitudinal and transverse specimens is also demonstrated. Figure 9(b) shows that there was considerable scatter for this alloy, but the effect of exposure on the bend ductility of the coated specimens is severe after 4,000 hours.

Ti-4Al-3Mo-1V.- The results obtained for the coated and uncoated Ti-4Al-3Mo-1V specimens stressed at 100 ksi showed no loss of specimen bend ductility within 7,000 hours. These results indicate that Ti-4Al-3Mo-1V is not susceptible to stress corrosion cracking for at least 7,000 hours under the test conditions.

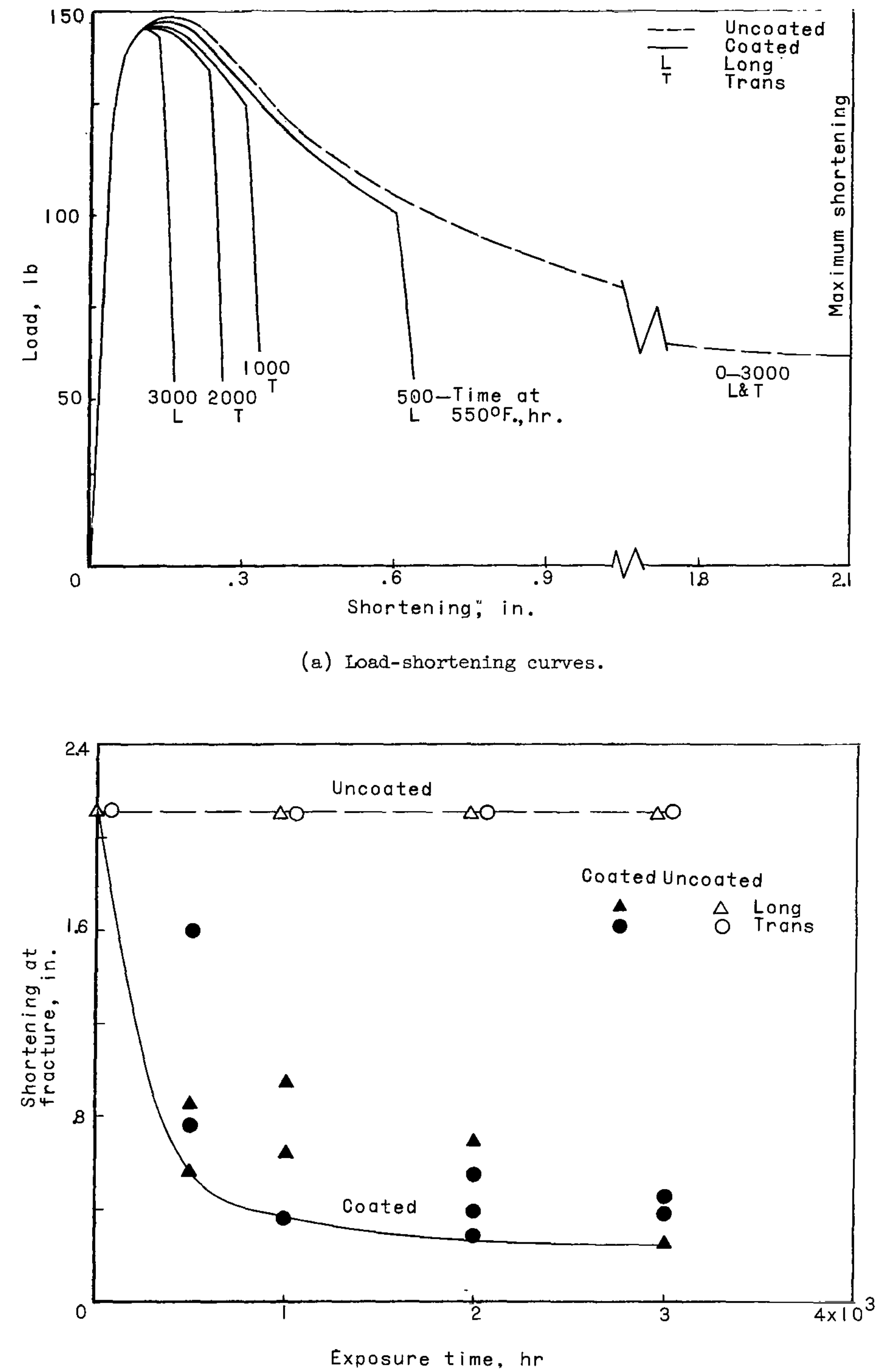
Comparative results.- Figure 10 shows the comparison of results obtained from the compression tests for the four titanium alloys. The comparison is based upon the limiting curves of figures 6 to 9 from which the relative shortening (ratio of the shortening at fracture for a coated specimen to that for an uncoated specimen at the same exposure time) was determined. On this basis, the most serious effects of stress corrosion on the shortening and the bend ductility were obtained for Ti-8Al-1Mo-1V, followed by Ti-6Al-4V and Ti-13V-11Cr-3Al. As mentioned previously, Ti-4Al-3Mo-1V did not appear to be susceptible to stress corrosion under the imposed conditions for exposure times up to 7,000 hours.



(a) Load-shortening curves.

(b) Shortening at fracture as a function of exposure time.

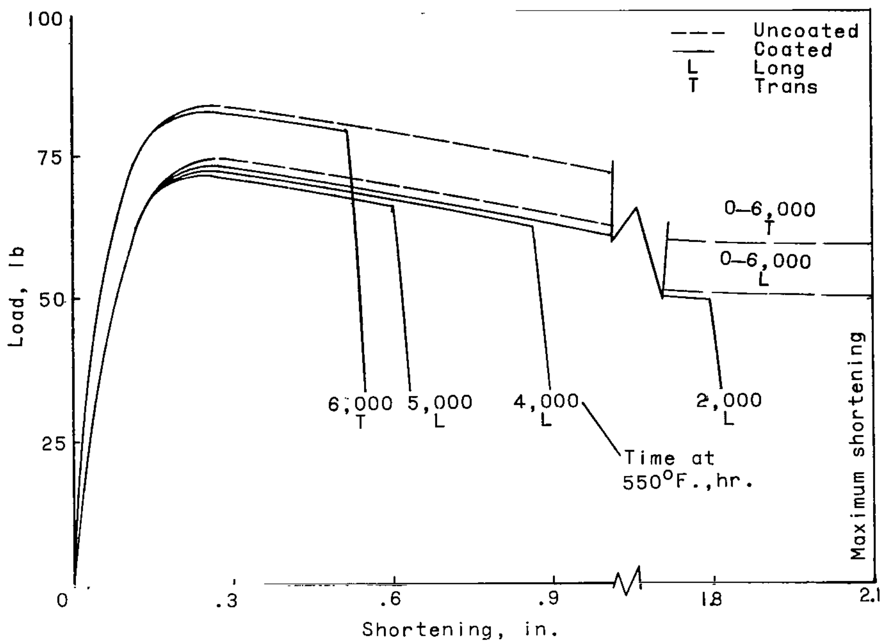
Figure 7.- Results of compression tests for Ti-8Al-1Mo-1V specimens stressed at 100 ksi.



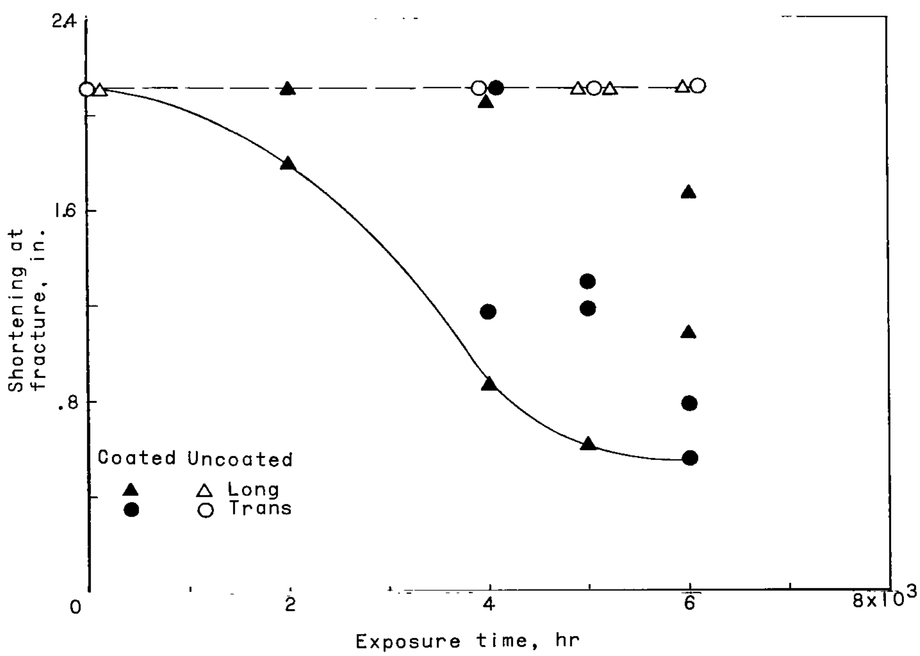
(a) Load-shortening curves.

(b) Shortening at fracture as a function of exposure time.

Figure 8.- Results of compression tests for Ti-8Al-1Mo-1V specimens stressed at 50 ksi.



(a) Load-shortening curves.



(b) Shortening at fracture as a function of exposure time.

Figure 9.- Results of compression tests for Ti-13V-11Cr-3Al specimens stressed at 100 ksi.

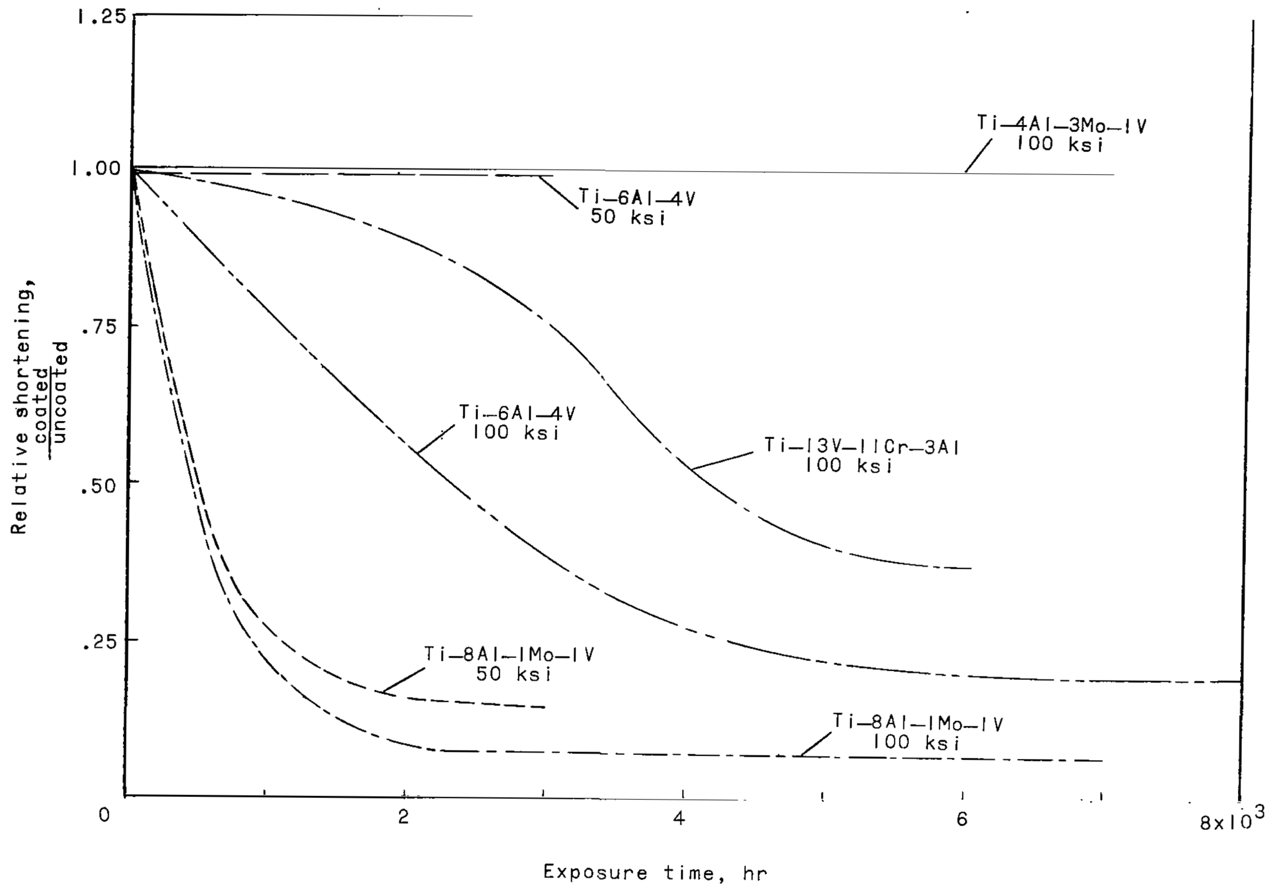
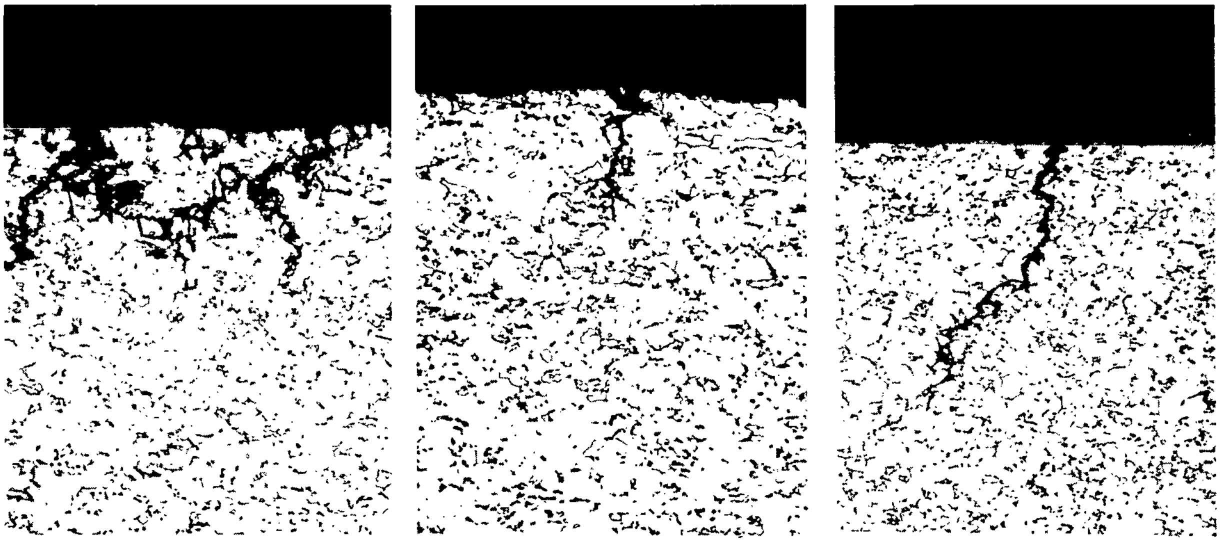


Figure 10.- Relative shortening of coated specimens as a function of exposure time.

Metallographic Examination

Gray corrosion products were found on the surface of coated Ti-8Al-1Mo-1V and Ti-6Al-4V specimens after exposure, but there were no noticeable corrosion products on any of the coated Ti-13V-11Cr-3Al or Ti-4Al-3Mo-1V specimens. Attempts to analyze the corrosion products by X-ray diffraction techniques failed to yield conclusive identification. Stress corrosion cracks were found in the Ti-8Al-1Mo-1V at both 100 and 50 ksi, in Ti-6Al-4V at 100 ksi, and in Ti-13V-11Cr-3Al at 100 ksi. Cracks in all cases were found to nucleate along the outer surfaces of the curved portion of the specimen and were oriented perpendicular to the induced tensile stress.

Crack nucleation.- Stress corrosion cracks in Ti-6Al-4V, stressed at 100 ksi, were found to nucleate in three different ways as shown in figure 11. First, cracks emanated from areas of general corrosion (fig. 11(a)). Areas of general corrosion were found on the compression surfaces as well as the tension surfaces of specimens, but never penetrated more than 0.002 inch into the base material. Second, cracks nucleated from pits as shown in figure 11(b). In the third and



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(a) Stress-corrosion cracks emanating from general corrosion. ×500.

(b) Stress-corrosion crack emanating from a pit. ×500.

(c) Stress-corrosion crack emanating from surface. ×500.

Figure 11.- Crack nucleation in Ti-6Al-4V specimens stressed at 100 ksi.

most numerous case, cracks nucleated at the surface without any apparent pitting or general corrosion present (fig. 11(c)). All microscopic examinations indicate that these cracks probably nucleated at grain boundaries on the surface. No stress corrosion cracks were found in the Ti-6Al-4V specimens stressed at 50 ksi and exposed for 3,000 hours. Small stress corrosion cracks were found in the specimens stressed at 100 ksi after 50-hour exposure. This result agrees favorably with reference 2 which notes cracks in Ti-6Al-4V within 75 hours at 550° F and 90 ksi.

All stress corrosion cracks examined in the Ti-8Al-1Mo-1V specimens stressed at 100 ksi and 50 ksi appeared to nucleate at grain boundaries on the surface. There was no pitting or general corrosion found in any of the Ti-8Al-1Mo-1V specimens. Small cracks were found in the specimens at 100 ksi after 50 hours of exposure and in the specimens at 50 ksi after 1,000 hours. Although cracks were not observed in the latter specimens until 1,000 hours exposure, it is very likely that cracks were formed before this time (based on the results of the compression tests on specimens exposed for only 500 hours (fig. 8)). It must also be remembered that each section examined for cracks was only a small portion of the entire specimen.

Stress corrosion cracks were observed in the Ti-13V-11Cr-3Al specimens stressed at 100 ksi after 5,000 hours exposure and appeared to nucleate at grain boundaries on the surface. Again, it is likely that cracks developed sooner (based on the compression tests shown in fig. 9). No cracks were found in the

Ti-4Al-3Mo-1V specimens at 100 ksi exposed up to 7,000 hours; this fact agrees with the results of the compression tests.

Crack propagation.- Two typical stress corrosion cracks found in the Ti-6Al-4V specimens at 100 ksi are shown in figures 12 and 13. Figure 12 shows the top

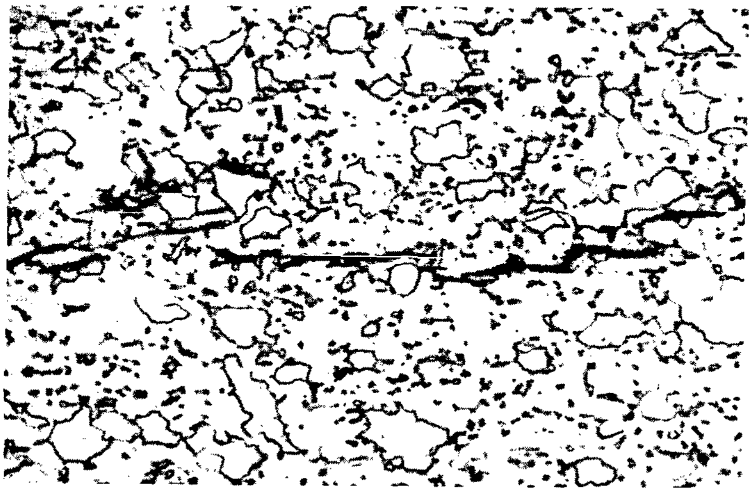

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Figure 12.- Top view of stress corrosion crack on surface of Ti-6Al-4V transverse specimen at 100 ksi exposed at 550° F for 7,000 hours. ×1,500.

view of a crack found in a transverse specimen exposed for 7,000 hours, and figure 13 shows the edge view of a crack found penetrating into a transverse specimen exposed for 4,000 hours. Both figures demonstrate the intergranular nature of stress corrosion cracking in this material. The Ti-6Al-4V alloy consists of an alpha phase and a finely dispersed beta phase in the form of platelets. Electron micrographs of stress corrosion cracks, such as the one shown in figure 14, were useful in studying the manner in which cracks propagated through the alpha and beta phases. The cracks are seen to progagate along the alpha grain boundaries and the alpha-beta interfaces.

Stress corrosion cracks found in Ti-8Al-1Mo-1V specimens stressed at 100 ksi were intergranular and are shown in figures 15 and 16. Figure 15 is a top view of a crack found on the surface of a longitudinal specimen exposed for 2,000 hours. The microstructure consists of small beta platelets interspersed in the alpha grain boundaries. The crack propagated along the alpha grain boundaries and the alpha-beta

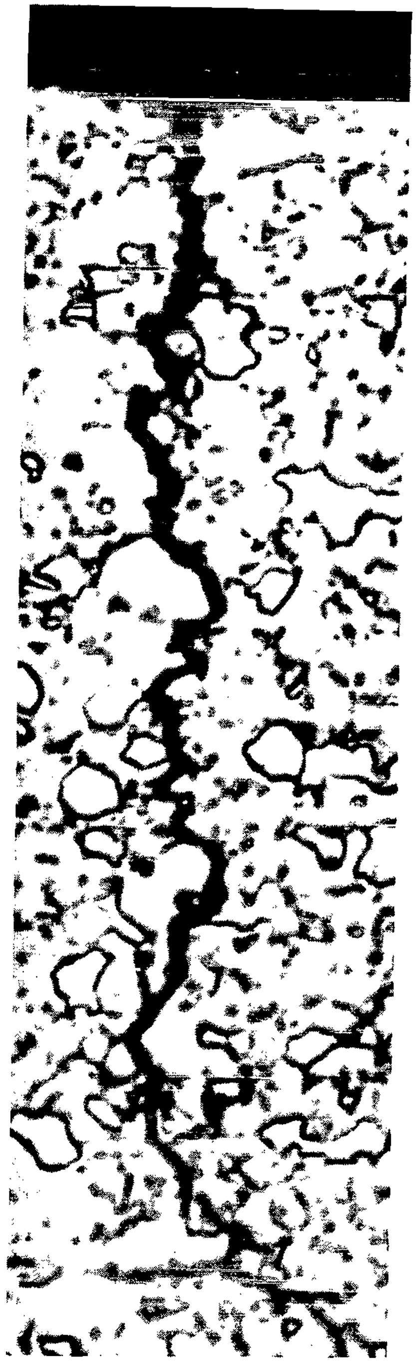

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Figure 13.- Edge view of stress corrosion crack in Ti-6Al-4V transverse specimen at 100 ksi exposed at 550° F for 4,000 hours. ×1,500.

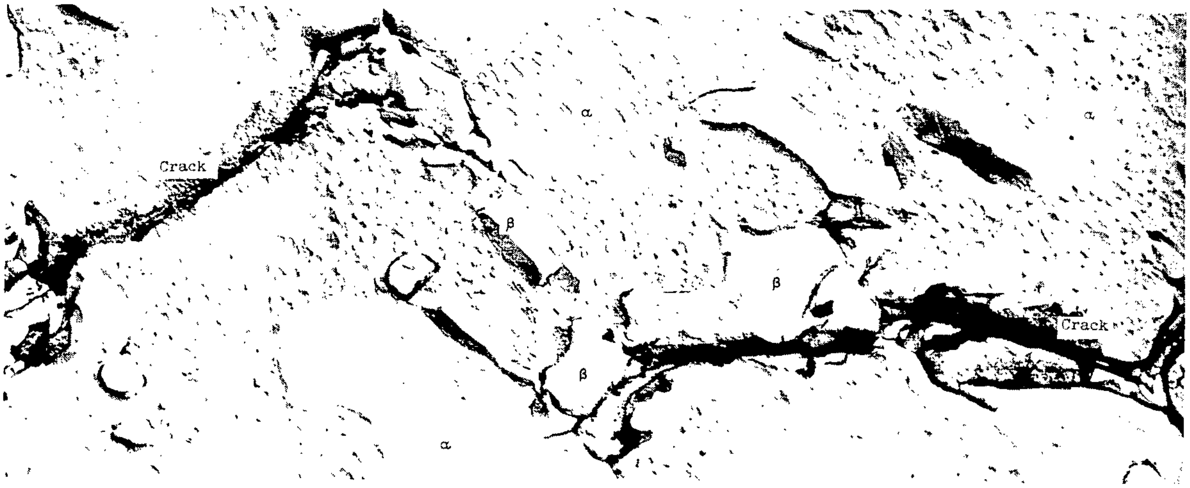

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Figure 14.- Composite electron micrograph showing portion of stress corrosion crack in Ti-6Al-4V longitudinal specimen at 100 ksi exposed at 550° F for 4,000 hours. ×6,000.

interfaces. Figure 16 shows the edge view of a crack penetrating into a longitudinal specimen exposed for 2,000 hours and demonstrates the intergranular nature of stress corrosion cracking in Ti-8Al-1Mo-1V. The electron micrograph in figure 17 shows clearly how a crack on the surface of a transverse specimen exposed for 2,000 hours propagated along the alpha grain boundaries and alpha-beta interfaces in this material.

The stress corrosion cracks observed in the all-beta alloy, Ti-13V-11Cr-3Al, were intergranular. Figure 18 shows an edge view of a crack penetrating into a specimen that was exposed for 5,000 hours.

Crack penetration.- Crack penetration in the Ti-6Al-4V, Ti-8Al-1Mo-1V, and Ti-13V-11Cr-3Al specimens is plotted against exposure time in figures 19 and 20. The number of cracks measured as well as the range of crack penetration is shown. The limiting curves shown for each material, are based upon the penetration values for each exposure time and represent approximately the maximum stress corrosion damage. This interpretation is similar to that used for stress corrosion crack penetration in austenitic stainless steels in reference 3.

The crack-penetration data for the Ti-6Al-4V specimens at 100 ksi are presented in figure 19(a). The limiting curve rises quite rapidly up to approximately 4,000 hours and then levels off.

The crack-penetration data for the Ti-8Al-1Mo-1V specimens at 100 ksi are shown in figure 19(b). The limiting curve increases very rapidly up to 2,000 hours; however, lower values of penetration were observed from 4,000 to 7,000 hours. Although this is consistent with the results of the compression tests in figure 7, one would not normally expect a decrease in stress corrosion damage with increasing exposure time. Consequently, a limiting curve representing the maximum stress-corrosion damage is not shown beyond 2,000 hours. An

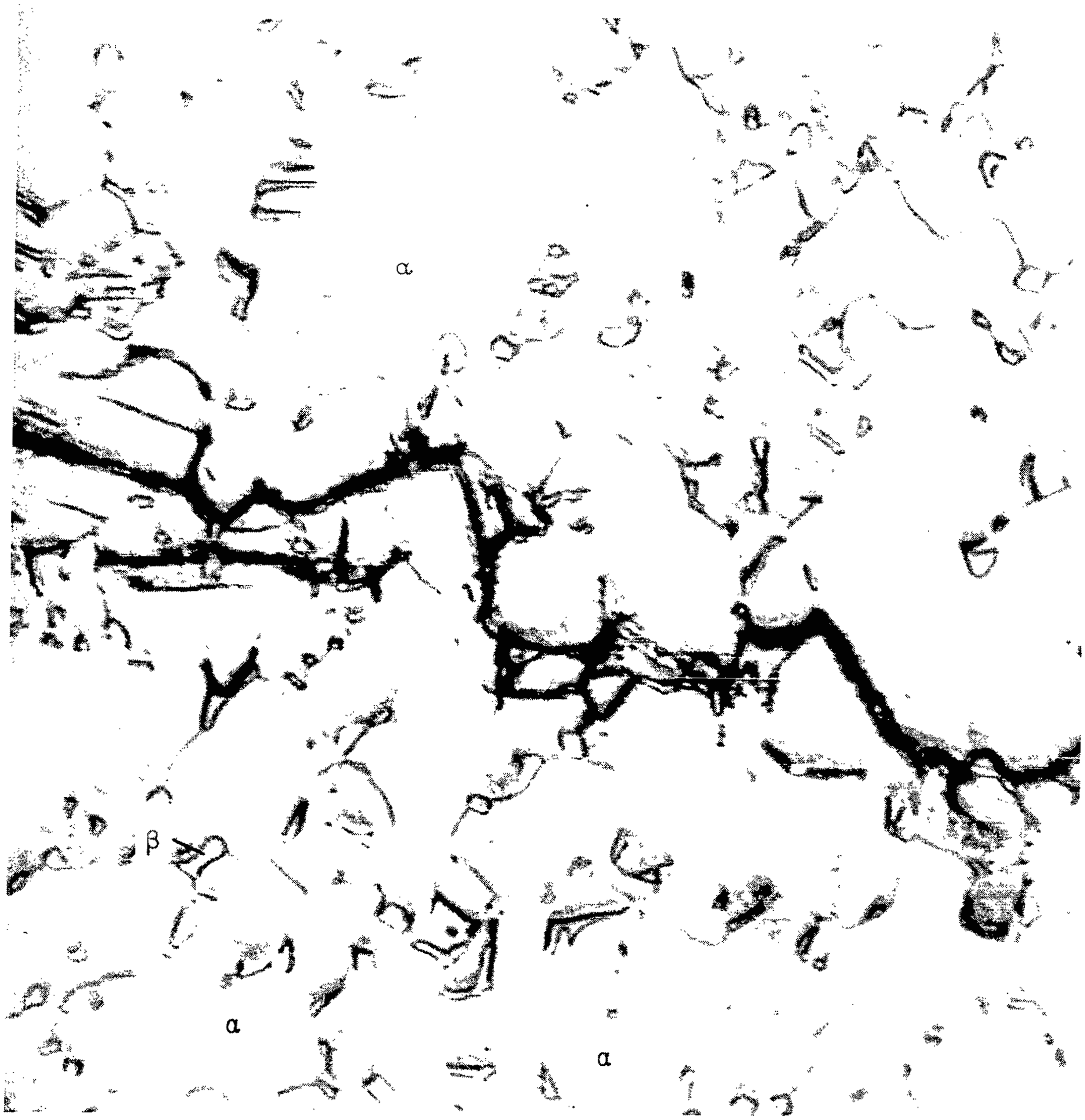

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Figure 15.- Top view of stress corrosion crack on surface of Ti-8Al-1Mo-1V longitudinal specimen at 100 ksi exposed at 550° F for 2,000 hours. ×2,500.

examination showed that surfaces of specimens exposed from 4,000 to 7,000 hours had fewer gray corroded areas than those exposed up to 2,000 hours. This difference in appearance, and in results, may be due to a difference in the initial coating conditions of the specimens exposed longer than 2,000 hours. These coatings were prepared earlier in the program before coating techniques were fully developed.

The crack-penetration data for the Ti-8Al-1Mo-1V specimens at 50 ksi are presented in figure 20(a). The limiting curve increases rapidly up to 2,000 hours.

Figure 20(b) shows the crack-penetration data for the Ti-13V-11Cr-3Al specimens at 100 ksi. Although cracks were not observed at 2,000- and 4,000-hour exposure, the limiting curve was arbitrarily drawn for these exposures to conform with the results of the compression tests shown in figure 9.

The limiting or maximum crack penetration curves for Ti-6Al-4V, Ti-8Al-1Mo-1V, and Ti-13V-11Cr-3Al are shown together in figure 21. These curves correlate very well with the relative shortening curves in figure 10. The maximum penetration curves follow the same relative order - with the more susceptible material having the greater crack penetrations. Moreover, the loss of bend ductility due to stress corrosion cracking for a particular exposure time corresponds directly to the maximum crack penetrations for the same exposure. Since there is such a close correlation between losses in bend ductility and maximum crack penetration, it is safe to assume that the effects due to general surface corrosion were negligible for these alloys. It should be pointed out that the maximum penetration curves tend to level off after long exposure times are reached. This leveling is probably due to the stress distribution associated with the self-stressed specimen in which the stress decreases with penetration. However, other factors such as the inability of the hot salt to penetrate into stress corrosion cracks during exposure may also be involved.

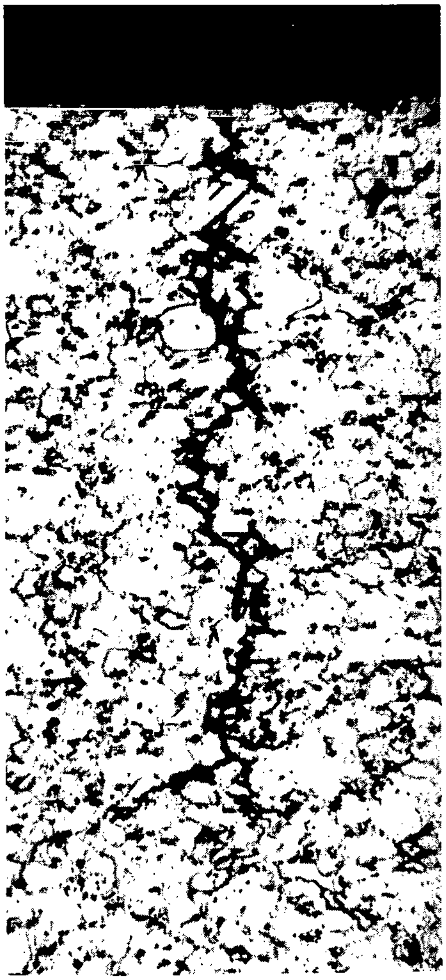

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Figure 16.- Edge view of stress corrosion crack in Ti-8Al-1Mo-1V longitudinal specimen at 100 ksi exposed at 550° F for 2,000 hours. X1,000.

Coating thickness.- The amount of salt coating was found to be an important factor with regard to stress corrosion at 550° F. Although the results are based upon relatively few tests, crack penetrations were about the same for specimens stressed at 100 ksi with heavy coatings (0.004 to 0.006 inch thick) as with medium coatings that are about half as thick. However, no stress corrosion cracks were

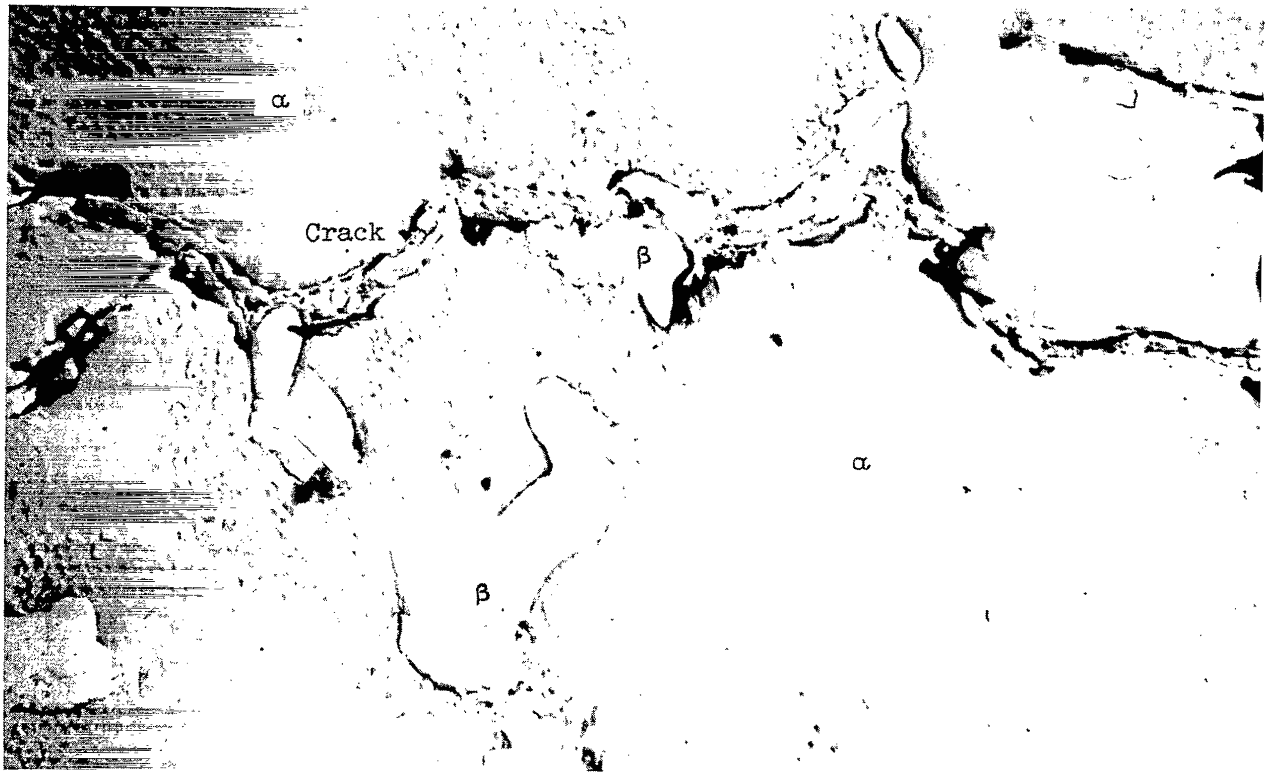

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Figure 17.- Electron micrograph of stress corrosion crack in Ti-8Al-1Mo-1V transverse specimen at 100 ksi exposed at 550° F for 2,000 hours. ×10,000.

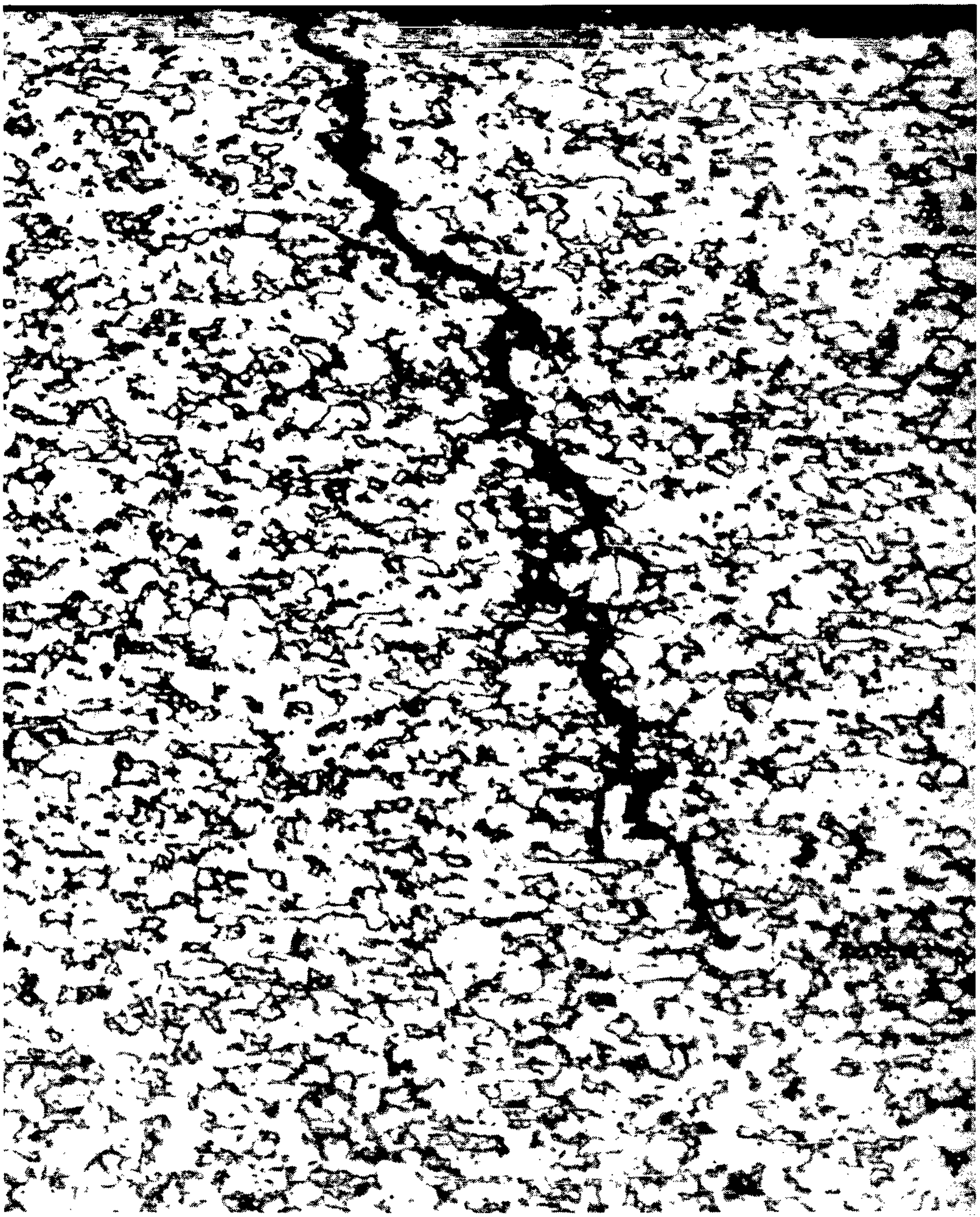

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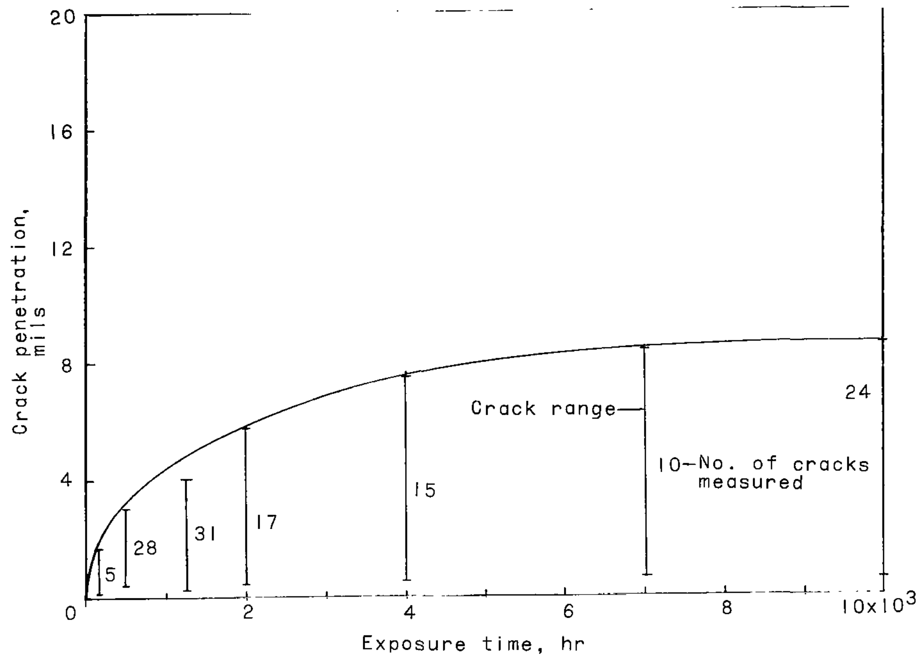
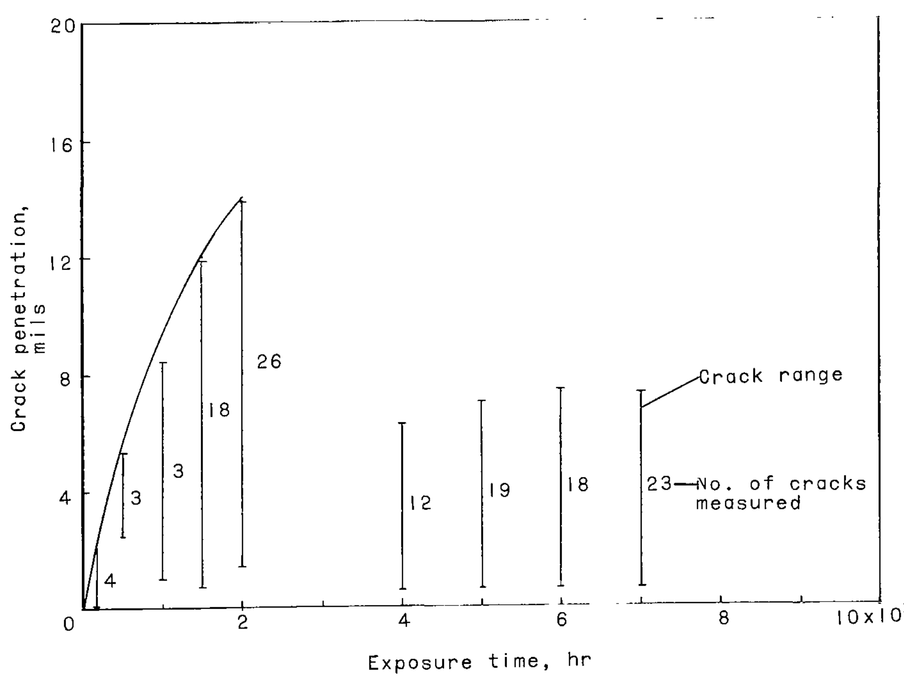
Figure 18.- Edge view of stress corrosion crack in Ti-13V-11Cr-3Al transverse specimen at 100 ksi exposed at 550° F for 5,000 hours. ×1,500.

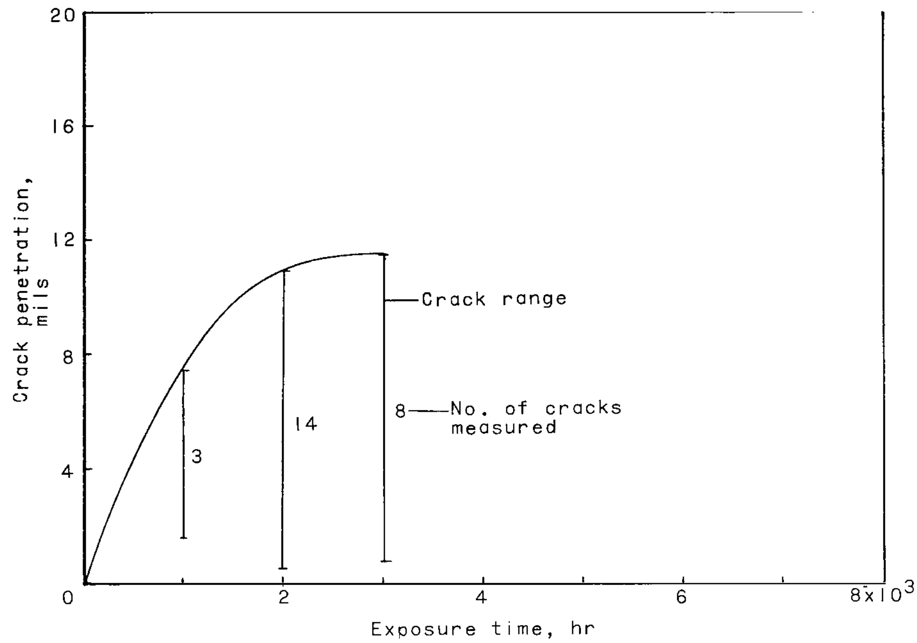


(a) Ti-6Al-4V.

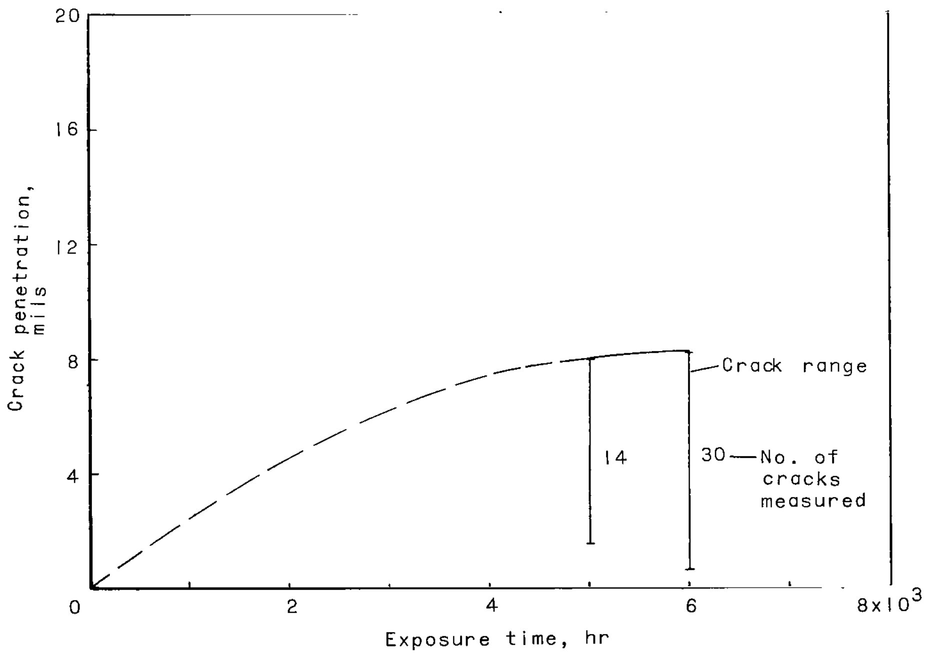


(b) Ti-8Al-1Mo-1V.

Figure 19.- Crack penetration in Ti-6Al-4V and Ti-8Al-1Mo-1V specimens stressed at 100 ksi as a function of exposure time.



(a) Ti-8Al-1Mo-1V.



(b) Ti-13V-11Cr-3Al.

Figure 20.- Crack penetration in the Ti-8Al-1Mo-1V specimens at 50 ksi and Ti-13V-11Cr-3Al specimens at 100 ksi as a function of exposure time.

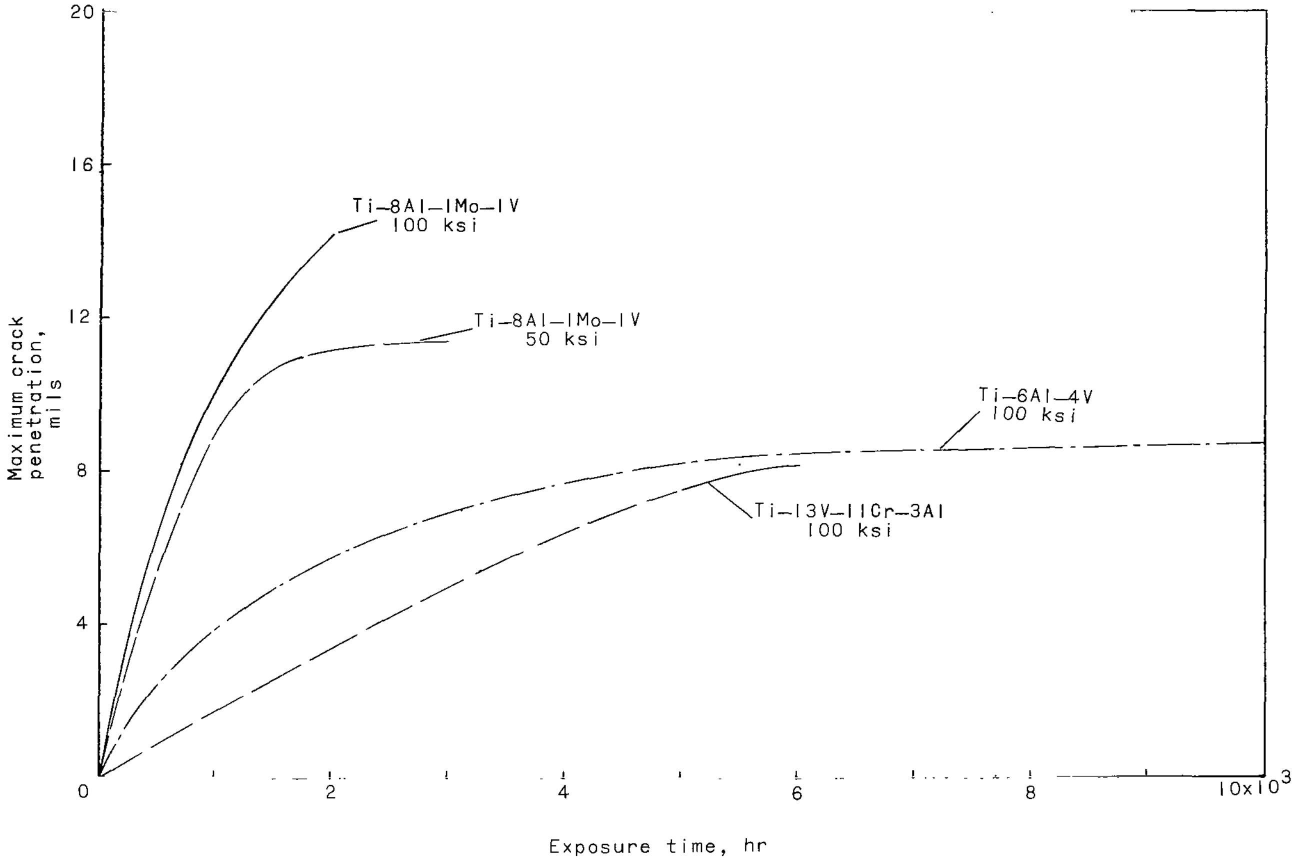


Figure 21.- Maximum crack penetration as a function of exposure time.

found in specimens with light coatings (0.0004 to 0.0007 inch thick) even after 2,000 hours of exposure. Consequently, this type of corrosion may not be a problem unless a substantial amount of salt is present.

CONCLUDING REMARKS

The relative susceptibility of four titanium-alloy sheet materials to salt stress corrosion at 550° F was investigated by using self-stressed corrosion specimens stressed at 50 and 100 ksi and coated with sodium chloride and exposed up to 10,000 hours. Based on the room-temperature compression tests and the crack-penetration data, the most susceptible alloy is Ti-8Al-1Mo-1V followed by Ti-6Al-4V, Ti-13V-11Cr-3Al, and Ti-4Al-3Mo-1V. No indication of stress corrosion cracking was observed for the Ti-4Al-3Mo-1V alloy.

When stressed at 50 ksi and exposed for 3,000 hours, Ti-8Al-1Mo-1V was susceptible to stress corrosion cracking whereas Ti-6Al-4V was not. Reducing the amount of salt on Ti-6Al-4V stressed at 100 ksi does not appear to alter the severity of stress corrosion damage markedly, unless extremely small amounts of salt are used.

The reduction in shortening or loss in bend ductility obtained in the compression tests of the new self-stressed corrosion specimens appears to be a convenient and sensitive method to determine the susceptibility of sheet materials to salt stress corrosion at elevated temperature.

Although this investigation indicates that severe salt stress corrosion can occur at 550° F in the titanium alloys under the test conditions, the results do not provide an assessment of the severity of the problem for a supersonic transport under actual operating conditions.

Langley Research Center,
National Aeronautics and Space Administration,
Langley Station, Hampton, Va., July 16, 1963.

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